CLAIMS

What is claimed is:

1. An apparatus to control positions of plural mirror segments in a segmented mirror, comprising:

an edge sensor system to output current edge sensor measurements corresponding to respective positions of plural mirror segments; and

a controller to produce actuator commands for controlling plural mirror actuators by comparing the current edge sensor measurements with calculated edge sensor bias measurements representing a global radius of curvature, wherein the plural mirror actuators respond to the actuator commands by moving respective positions of the mirror segments.

2. The apparatus according to claim 1, wherein said controller further comprises:

a global radius estimator and control unit to accumulate the actuator commands output from said controller and to calculate the edge sensor bias measurements from the accumulated actuator commands and an estimator matrix.

3. The apparatus according to claim 2, further comprising:

a summation unit to calculate a plurality of edge sensor error signals from the current edge sensor measurements and the edge sensor bias measurements; and

an optimal control matrix unit to accumulate the plurality of edge sensor error signals calculated by said summation unit and output the corresponding plurality of actuator commands.

4. The apparatus according to claim 3,

wherein said summation unit calculates the plurality of edge sensor error signals through combination of the current edge sensor measurements, the edge sensor bias measurements and a plurality of edge sensor reference measurements.

5. The apparatus according to claim 3, said global radius estimator and control unit further comprising:

an accumulator unit to receive and store the actuator commands; and

an estimator matrix to produce edge sensor bias measurements from the plurality of stored actuator commands,

wherein said summation unit calculates the plurality of edge sensor error signals from the current edge sensor measurements, the edge sensor bias measurements, and edge sensor reference measurements.

6. The apparatus according to claim 5, wherein the edge sensor reference measurements are recorded when the segmented mirror is initially aligned and the current edge sensor

measurements are recorded after movement of the plural mirror segments.

7. The apparatus according to claim 1, wherein the edge sensor system includes a plurality of sensors respectively attached to a corresponding plurality of hexagon mirror segments, said sensors outputting the plurality of current edge sensor measurements corresponding to movement of respective hexagon mirror segments.

8. The apparatus according to claim 1, wherein said plurality of mirror actuators are tip/tilt/piston control actuators.

9. The apparatus according to claim 1, further comprising:

an edge sensor control unit, disposed within said control unit, for producing the plurality of actuator commands; and

an accumulator unit, disposed within said control unit, for receiving and storing the actuator commands output from said edge sensor control unit,

wherein the stored actuator commands are used to calculate future actuator commands.

10. The apparatus according to claim 1, further comprising:

an edge sensor control unit, disposed within said control unit, for producing the plurality of actuator commands; and

an accumulator unit, disposed within said control unit, for receiving and storing the actuator commands output from said edge sensor control unit,

wherein the stored actuator commands do not include commands for controlling a plurality of boundary condition mirror segments, and the stored actuator commands are used to calculate future actuator commands.

11. The apparatus according to claim 10, wherein there are a total of four boundary condition mirror segments so configured and arranged as to define a sphere.

12. The apparatus according to claim 1, said controller further comprising:

an edge sensor control unit outputting the actuator commands in response to the current edge sensor measurements;

an accumulator unit to accumulate actuator commands output from said edge sensor control unit;

an estimator matrix to convert the accumulated actuator commands output from said accumulator unit into a plurality of boundary condition actuator commands,

wherein the boundary condition actuator commands are combined with the actuator commands output from said edge sensor control unit before transmission to corresponding actuators.

13. The apparatus according to claim 12, further comprising:

a summation unit to calculate a plurality of edge sensor error signals from the current edge sensor measurements and a plurality of edge sensor reference measurements.

14. The apparatus according to claim 12, wherein the edge sensor system includes a plurality of sensors respectively attached to a corresponding plurality of hexagon mirror segments, said sensors outputting the plurality of current edge sensor measurements corresponding to movement of respective hexagon mirror segments.

15. The apparatus according to claim 12, wherein said plurality of mirror actuators are tip/tilt/piston control actuators.

16. A method of generating a plurality of actuator commands to control a plurality of mirror segments, comprising:

receiving current edge sensor measurements corresponding to respective positions of plural mirror segments;

comparing the current edge sensor measurements with edge sensor bias measurements defining a global radius of curvature of the plurality of mirror segments; and

producing a plurality of actuator commands for controlling the plural mirror segments in response to said comparing operation.

17. The method according to claim 16, further comprising:

accumulating the plurality of actuator commands; and

producing the edge sensor bias measurements defining the global radius of curvature from the accumulated actuator commands by calculation of an estimator matrix.

18. The method according to claim 16, further comprising:

calculating a plurality of edge sensor error signals from the current edge sensor measurements and the edge sensor bias measurements; and

accumulating the plurality of edge sensor error signals calculated in said calculating operation and outputting the plurality of actuator commands for controlling the plural mirror segments.

19. The method according to claim 16, further comprising:

calculating the plurality of edge sensor error signals through combination of the current edge sensor measurements, the

edge sensor bias measurements, and a plurality of edge sensor reference measurements.

20. The method according to claim 16, further comprising:

receiving and storing the actuator commands; and

producing the edge sensor bias measurements from the plurality of stored actuator commands,

whereby said comparing operation compares the current edge sensor measurements with the produced edge sensor bias measurements.

21. An apparatus to control positions of plural mirror segments in a segmented mirror, comprising:

an edge sensor system to output a plurality of current edge sensor measurements corresponding to respective positions of a plurality of mirror segments;

a controller to produce a plurality of actuator commands by comparing the plurality of current edge sensor measurements with a plurality of edge sensor bias measurements defining a global radius of curvature; and

a plurality of mirror actuators responding to the plurality of actuator commands by moving the respective positions of the plurality of mirror segments.